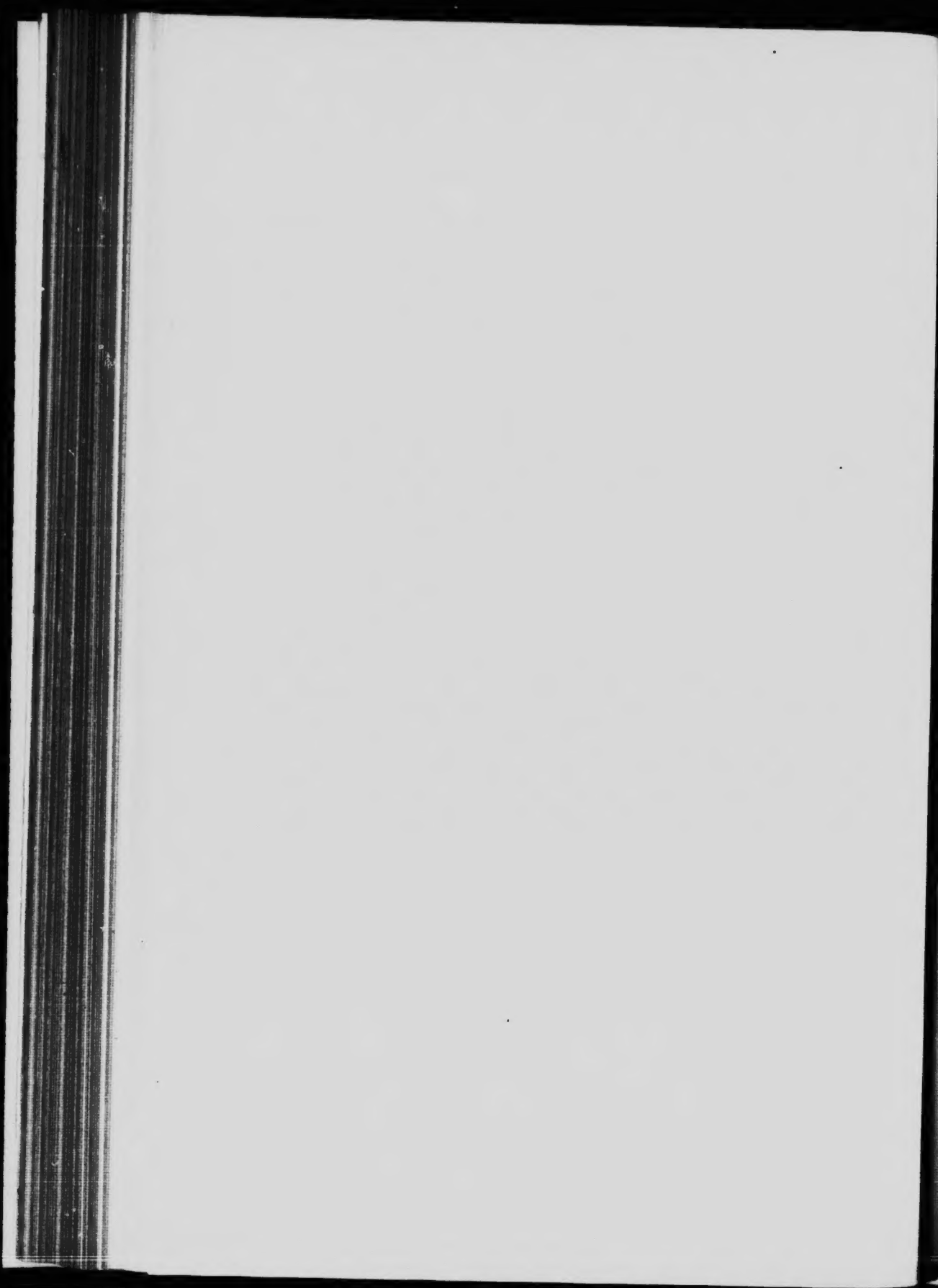






PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE
(HORTICULTURAL BRANCH).

RASPBERRY CULTURE.

THE cultivation of the raspberry has been steadily increasing in British Columbia during the past few years and in 1918 exceeded all other varieties of small fruits in tonnage and value. According to Bulletin 82, "Agricultural Statistics, 1918," the total production of raspberries listed as packages was 169,894, valued at \$379,591. This is equal to 2,378,516 lb. of fruit. Of this total, 1,258,040 lb., valued at \$151,334.67, was used by the canneries and jam-factories. The balance was used for fresh shipping and local consumption.

The industry is centred in the Lower Fraser Valley and the bulk of the crop is produced in the Mission and Hatzic Districts. Hammond, Haney, Chilliwack, Burnaby, and Ladner Districts also have large acreages which are increasing each year; in fact, practically the whole of the Lower Mainland is admirably adapted to the production of this fruit.

The raspberry group is comprised of three distinct types—the red raspberry, which bears red fruit; the black raspberry, which bears black fruit; and the purple raspberry, which bears purple fruit.

The red raspberry is a vigorous bush-builder, throwing out an abundance of new canes from the crown each year and sprouts from the roots. The young plants sprouting from the roots are used as the plants for setting out new fields. A few of the varieties now propagated came from Europe. The greater number, however, have been produced from the American wild raspberry.

The black varieties do not sprout from the roots. Long slender canes are sent out from the crown of the plant. At the end of the season these canes have arched over with their tips touching the

ground. These tips take root through the fall and winter, forming new plants for resetting. This berry, commonly called the "black-cap," of which there are many varieties, originally came from the native wild black raspberry. The Cumberland is the most popular variety.

The purple raspberry is a "cross" between the red raspberry and the "black-cap"; it is propagated from plants grown from the tips of the new canes, the same as the "black-cap" type.

District Distribution.

The northern section of the United States and the southern section of the Dominion of Canada is the belt of successful raspberry-culture. In this belt the desired districts are around the Great Lakes, the New England States, and the Pacific Coast west of the Cascade Mountains and north of the Oregon-California line into British Columbia.



Five-acre commercial raspberry plantation, Hatzic, B.C.

Where to Plant.

The native raspberry is found largely in localities having a cool climate, as the districts of distribution will show. The cultivated raspberry demands a like environment and will not thrive where the summers are too hot or the winters too severe.

For other than home use, the location of the plantation should be governed by the distance to market both local and shipping, precooling facilities, the distance to the by-products factory, and the demand.

Local Conditions to govern Planting.

A rich, deep, moist, sandy loam is the desired soil for the raspberry, but sandy and clay soils, if properly managed, yield profitable

returns. However, whatever type of soil is chosen for a plantation, it should be well drained and tilled and supplied with ample moisture throughout the growing season. The Cuthbert raspberry is one variety that seems to thrive on a wider range of soils than any of the others.

Whether the soil be sandy, sandy loam, clay loam, or heavy clay, the governing factor is moisture. This may be by irrigation or by the dry-farming method if necessary. The raspberry, however, will not thrive on poorly drained semi-sour soils.

For home planting the chicken-run is a good place to plant this fruit. It affords shade for the chickens, which in return manure the soil and keep down the weeds.

Preparing the Plant-bed.

A good seed-bed is a good start. A seed-bed which was planted to a cultivated crop the previous year is desirable. Making a seed-bed from sod land is a discouraging beginning. The top soil cannot be sufficiently cultivated and the task of keeping down weeds and grass increases the first costs of the plantation.

If raw land is selected for planting it should be planted to a cultivated crop the year previous to planting.



A good type of single-horse disk for use in raspberry, loganberry, and blackberry plantations.

Time to Plant.

Red raspberries may be planted any time in the fall, winter, or spring, when the ground is not frozen, in the Lower Fraser Valley. In other parts of British Columbia it is well to plant in the spring when the frost has left the soil.

For the black and purple raspberries it is better to plant in the spring in all districts.

Should it be desired to plant two-year-old tips, fall and winter planting of the black and purple raspberry is practical in the Lower Fraser District.

Handling the Plants.

If the plants to be used are from the home or near-by plantation, the seed-bed should be ready when the plants are dug and they should be transferred at once. Some years in the Lower Fraser conditions are favourable for late spring planting; i.e., the planting is not done until about a month after growth starts, and then the young plants with the new growth are transplanted. However, this is not recommended, as a dry season means failure.

In selecting plants pick out those with strong crowns and roots. Remove all canes from each crown but one, and head this one back 8 to 12 inches in length. Often plants from the nursery arrive before the seed-bed is ready. In this case "heel them in"; i.e., dig a trench 8 to 10 inches deep. Cut the bundles of plants and distribute them close together in this trench. Cover the roots and crowns well with earth; in this way they will keep satisfactorily until ready to plant permanently.

System of Culture.

Of the several systems used for planting, the hill system is the one most practical and most extensively used in commercial work.

For a large plantation the rows should be at least seven feet apart, but 8 feet is preferred to allow room for cultivation and picking. The plants in the row are set 30 inches to 36 inches apart. Sprouts coming up away from the original crown should be cut away or dug up for new plants. Retaining the original crown throughout the life of the plant is advisable.

When setting a plantation mark off the rows 8 feet apart, running north and south if possible. Two men save time in planting. Carry the plants in a bucket one-third full of liquid mud. Use a long-handled spade for setting. One man should set the spade the full length of the blade where each plant is to be set, push forward on the handle, and the other man set the plant in the opening thus made. As the man with the spade sinks the spade in for the next plant 30 inches forward, his rear foot firms down the earth around the roots of the plant just set.

Using this two-men method of planting—i.e., one setting the plants, the other handling the spade and tramping in the plants—two men will set a large number of plants in a day.

The plants should be set slightly deeper than they formerly grew, and great care should be taken to keep roots moist while out of the ground.

Moisture Requirements.

Raspberry-plants after they are set need more moisture than most other fruit-plants. Alternate drying and wetting will affect the plant seriously.

When planting is completed keep a dust-mulch by disk-harrowing or spring-tooting every ten days to two weeks throughout the summer months.

In the semi-arid and arid regions of British Columbia, if the raspberry can be grown successfully, irrigation should begin almost as soon after the rainy season as is necessary for field crops. The artificial moisture necessary throughout the dry season should be governed by local showers and the condition of the soil. As soon as possible after each irrigation the cultivator should be used to form a dust-blanket until the next watering.

Intercropping.

The first year after setting a plantation there is no revenue from the plants. However, any crop needing constant cultivation may be planted between the berry-rows, according a return from two-thirds of the land.

The second year after planting raspberries, however, nothing should be planted between the rows and the rows kept thoroughly cultivated. A seemingly unnecessary dollar spent for labour in
ling small fruits often returns ten in its place.

Tillage.

Tillage in raspberries must be constant. If sprouts, weeds, and grass are allowed to get a start between the hills before the plants are large it becomes an endless job to keep them clean. However, if the ground is kept perfectly clean the first two years, the shade from the bushes leaves little work between the hills.

If grass and sprouts are allowed to gain headway, the life of the plantation is lessened a good many years. Do not allow sprouts to grow outside of the original crown. They may look like money-makers for next year, but they are deceiving impostors. The money-makers are the six to eight canes from the original plant. They are the insurance of a plantation which, if well pruned and cultivated, will last at least ten to fifteen years.

Cover-crops to retain Fertility.

Stable manure is considered one of the best fertilizers, if it can be secured at a satisfactory price.

Correct cover-crops give good practical returns and may be used where stable manure is not available.

Oats drilled at the rate of 3 bushels per acre in late summer after picking should give a dense stand to turn under as a green manure in the late fall.

Peas, vetches, clover, etc., mixed with oats or wheat, make satisfactory fertilizers and should be drilled between the rows in the fall and ploughed under in the spring when about 12 inches high.

Pruning and Training.

Raspberries bear on one-year-old canes only. Red raspberries send up suckers from their roots away from the original crown. The black and purple varieties do not send up suckers away from the original crown.

Deep ploughing may cause an abundance of suckers to sprout from the points of injury on the roots; hence, if the original crown is not protected by cutting away all suckers, it would take only a few years to form a solid thicket and a "run-out" plantation.



Raspberries grown according to the hill system, and trained by tying the canes to the wires, allowing new growth to come up in the centre.

For most commercial varieties grown on the Pacific Coast posts are set 30 feet apart in the row. On each post is nailed one cross-arm (1 x 6) 18 to 24 inches long. On the outer edges of these cross-arms are strung two No. 12 or No. 14 galvanized wires,

set in slots made by sawing down about three-quarters of an inch in the edge of the board with an eight-point saw.

By setting the wires in these slots the wires may be lifted out free from the post when training or pruning. Do not nail the wires to the cross-arms.

It has been the general practice in the culture of the red raspberry in British Columbia to head back the fruit-bearing canes in the spring, and a number of growers have practised tying the canes in bunches of three or four to the wires on either side and allowing the new growth to come up in the centre. This system of training and pruning in the commercial raspberry district of Puyallup, Washington, has been almost entirely abandoned. It is claimed that by not heading the canes back the crop will begin to ripen at least a week earlier, and that the picking season is extended from a week to two weeks. This naturally increases the yield and distributes the picking over a longer period, preventing a great rush for a short period, which is an advantage. The fruit ripens on the terminals first and proceeds to ripen downward. This non-heading and twining system having proved successful in the Puyallup District, it is thought wise to suggest it here and advocate its trial on a portion of the plantation at least.



Raspberries trained by the twining system. Canes allowed to come up indiscriminately, making a continuous row.

In the spring, before any indication of growth is evident, the canes to bear fruit are twined and roped around each wire. This is a simple process and takes much less time than heading back and tying to the wires. The new growth is allowed to come up in the centre.

Some growers practise pinching out the terminals of the new canes during the summer in order to make them branch, and it is claimed by this system that the productiveness is increased.

There is no doubt but that this method makes a more bushy plant and one which will have a tendency to stand up well without twining or tying, but it is a very debatable question as to whether the yield is increased, and if practised over a large acreage it is a fairly expensive operation.



A common method of training raspberries between two wires.

No matter what system is adopted, it is advisable, as soon as possible after the crop is harvested, to cut out the old canes and burn them. This not only gives the new canes a better chance, but helps to get rid of any disease or insect pests which may be attacking the canes.

Harvesting.

Raspberries are a very tender commercial fruit-crop and must be picked and handled carefully. The appearance on the market is governed by the treatment given the fruit when picking and

packing. Berries bruised in handling or picked when wet will be quickly attacked by decaying mould after they start on their way to the consumer.

To avoid injury in picking three fingers always should be used. Never more than three or four berries should be held in the hand at one time and laid gently into the hallock (shipping-cup). For shipping purposes bushes should be picked thoroughly clean every other day, and, if possible, every day. If clean picking is not practised, overripe berries three or four days old will be mixed with the pack. A few overripe berries in each hallock and the entire crate will arrive at its destination covered with "blue mould."

Raspberries should never be repacked, but placed into crates just as they come from the picker.



Showing raspberry plantation in the spring after trimming.

Each picker is supplied with a waist-carrier and a hand-carrier. The waist-carrier is fastened with two strings around the waist and holds one or two hallocks. The hand-carrier holds six hallocks, and as the picker fills each two cups at the waist these are carefully transferred to the hand-carrier. These carriers hold eight hallocks together; the picker being given credit on picking-card for one-third crate each time they are filled.

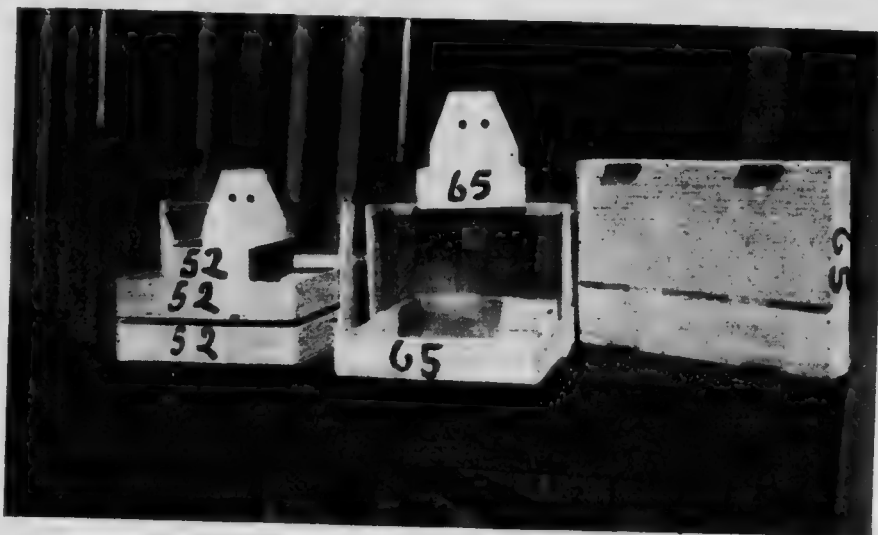
The carriers are numbered to correspond to the picker, several carriers being allowed each picker to save time at the packing-shed. Each row in the field is numbered. A picker is assigned a row and charged with the number of that row. When the row is finished, picker calls, "Check Row No. . ." The picking-boss assigns a new row and charges it and inspects the row just finished.

If the rows are not finished satisfactorily, the number of the picker who picked the row is called and it is gone over again.

Numbers, not names, should be used with a gang of pickers. One picking-boss should be able to supervise twenty-five to thirty pickers, and this special supervisor is the secret of successful fresh shipping and a good investment.

Yields.

The red raspberry yield is governed by the care the plantation is given. Yields vary from 4,000 to 10,000 lb. per acre. The life of a plantation well cared for is known to be as long as twenty-five years. The poorly kept plantations, however, run out from six to ten years.



Type of waist-carrier and double-decked field-carriers used at Sunnyside Farm, Hazelton, B.C.

Propagation.

To propagate the black and purple raspberries the tips of the new canes should be buried in moist soil in late summer. The following spring these tips will have formed new plants with an abundance of small roots. The cane should then be severed, leaving a few inches of cane attached to the new plant, which is ready to be set in a commercial field.

If it is desired to propagate an exceptional number of plants in the fall, the tips of the new growth should be pinched off in the spring when $2\frac{1}{2}$ or 3 feet long. This encourages a number of side limbs, each of which may be tipped in the fall for new growth.

Red raspberries send up sprouts (suckers) around the parent plant which are used for new planting.

If a large number of plants are wanted, a given part of an old plantation may be chopped out in the winter and kept clean and cultivated until two weeks after growth starts, after which a thick field of new plants will spring from the remaining roots of the old plants. This is suggested for those who wish to raise thousands of plants for commercial planting.

Varieties.

Cuthbert.—In British Columbia the most popular and extensively planted variety at the present time is the Cuthbert, and this statement is practically true of all commercial raspberry sections in North America. This variety is of fine quality and one of the best for canning, and is also a good shipper. The berries are large, conical, deep, rich crimson, firm, and season is medium to late. It is, however, not hardy in some districts, especially in exposed positions.

Herbert.—This is a berry of Canadian origin, and has proved to be extremely hardy. Due to the fact that the Cuthbert is being killed out in different sections, the Herbert is gaining in popularity. The berries are large, somewhat conical, bright red, but slightly softer than the Cuthbert. However, they have stood up well in shipping. They are an excellent table-berry. It is a mid-season berry, coming in a little earlier than Cuthbert.

Marlboro.—This is an early variety which is not extensively grown in British Columbia. Berries are medium to large, bright red, firm, seeds large. It is a good shipper, but only of fair dessert quality.

Antwerp.—One of the few varieties of European origin which is grown. Its cultivation is not extensive in British Columbia. Berries large, slightly conical, dark red, fairly firm, rather acid; season is early, but later than Marlboro.

Precooling and Drying Plant.

There has not been a great deal of this work done in the raspberry sections. However, during 1919 the Fruit and Mercantile Exchange of Hatzic built and equipped a fruit-house with pre-cooling facilities, which was used to great advantage during the shipping season. It was also possible to put jam stock in barrels and tins and freeze it, holding it in this condition until it reached the manufacturer.

For a description of a home-made precooling plant the reader is referred to Circular 54, "Loganberry Culture" (New Horticultural Series).

Canning in Glass Jars.

Small fruits, like raspberries, strawberries, or loganberries, can be canned so as to retain their shape and colour and natural flavour without actual cooking.

Pack fruit into hot, sterilized jars and place in a tub partly filled with hot water. Fill jars to overflowing with boiling hot syrup and seal tightly. The syrup used may be medium thin, which is made in the proportion of $1\frac{1}{2}$ cups of sugar to 1 cup of water, and boiled 2 or 3 minutes. If a sweeter syrup is desired, boil for 5 minutes, and while it is boiling it should be poured over the fruit and the jars sealed immediately. Fill tub or kettle with boiling water, covering the tops of the jars. Cover closely and allow the jars to remain in the water 30 minutes.

Sun Preserves.

Raspberries, strawberries, cherries, and white currants lend themselves especially well to the following method: Use a pound of sugar to each pound of fruit. Put a layer of fruit in the bottom of the preserving-kettle and add 1 or 2 tablespoons of water. Alternate the layers of the sugar and fruit. Heat the mixture carefully until the sugar is dissolved; avoid crushing the fruit if possible. Boil the mixture for from 5 to 7 minutes. Pour it on to large platters and set it in the sun for a day. It should thicken or jelly on the platter. After it is cold and thickened, transfer from the platter to sterilized jars and cover with paraffin.

Raspberry, Strawberry, or Loganberry Jam.

2 lb. berries.

2 lb. sugar.

The best jam made from these fruits is made by adding water enough to the sugar to dissolve it, and boiling this syrup to the hard-ball stage, when it should hair well from a spoon. The fruit is then added, stirred, and brought quickly to a boil, boiling rapidly from 15 to 30 minutes or until thickened. Remove from heat, cool quickly, and skim any scum that may have gathered. Pour into stone jars or jelly glasses and seal or cover surface with melted paraffin.

NOTE.—If the berries are put into the hot, thick syrup, cooked quickly and then cooled, more of their natural colour and flavour is retained. Better results are obtained when made in small quantities.

For Beverage.

Manufacturing of fruit-juices is becoming an industry in itself. For home use, place 2 gallons of berries on the stove in a preserving-kettle. Crush and wilt them for about 15 minutes. Take off and put pulp and juice through a flour-sack or double cheese-cloth. Place the balance of the pulp in a wire press or wring out with the hands to extract all the juice. When all the juice is extracted, place on the stove again in a clean kettle, adding $1\frac{1}{2}$ to 2 lb. of sugar for each gallon of juice. Sterilize just to the boiling-point. The bottles or jars and corks or rubbers and lids should be sterilized in hot water. When juice has just reached the boiling-point, pour into sterilized bottles or jars and seal with sterilized stoppers. If corks are used in bottles, the cork should be sunk $\frac{1}{4}$ inch below the top of the bottle and this cavity filled with melted paraffine.

An excellent drink is a juice made with equal parts of logan-berries and raspberries.

Insect Pests and Diseases.

Crown-borer.—A pinkish-white grub with a brownish head which girdles the canes at the crown and bores in the stems of the canes. Its presence is recognized by canes which are partly or wholly dead and discoloured patches on the canes, due to girdling and stoppage of the sap. The plant will usually show general unthriftiness.

Remedy: Examine the roots when infection is noticed and again in the fall, and dig out the borers in the crown. Cut out old canes as early as possible after the crop is gathered, making the cut as close to the crown as possible.

Cane-maggot.—This pest causes a wilting of the young canes when they are from a few inches to a foot or 18 inches high.

Remedy: Cut out and burn immediately and the maggot will usually be destroyed.

Yellow Rust.—This occurs in the form of small spots on the leaves the size of a pin-head or less. These spots on close examination will be found to consist of a yellow powder of the spores of the fungus. A leaf badly attacked may have several hundred of these spots on it, and is then likely to shrivel up prematurely, resulting in the fruiting-cane being weakened to a certain extent. The disease is native to the country, occurring on wild raspberry, but usually it does not attract much attention. In the spring of 1919, however, it was unusually prevalent and a good many inquiries were received about it. Careful watch was therefore kept on its effects. In most cases it did not seem to result in any appreciable

loss in the yield of fruit. Where it was severe it undoubtedly did some injury. It was, however, difficult to estimate how much of the loss was due to the disease itself and how much to the drought of last summer. On the whole, it would seem that it is not necessary for growers to be alarmed over this disease, and it would not seem to warrant special measures of control.

The orange rust, which is serious in the East, and in which the leaves of an affected plant are stunted, curled, and covered with a mass of brilliant orange-red spores, has not been noticed in British Columbia.

Anthraxnose.—This forms sunken brown or blackish spots on the canes. When these are numerous, and especially if they run together around the canes, the latter either die or are incapable of maturing a crop of fruit. A rotting of the berries which sometimes also results from the disease does not seem to occur to any extent in British Columbia; in fact, the disease itself is not nearly so prevalent as might be expected. Infection takes place in the young canes, but the results are often not observed until the fruit is developed.

Cane-blight.—This already causes a certain amount of loss and is liable to do much more if care is not taken, the disease having proved very serious in Eastern sections. Attention is often called to the disease for the first time by the sudden wilting of the canes and consequent drying-up of the fruit before maturity. Such injury may be put down to drought, but if an examination is made it will likely be found that there are dead spots on the lower parts of the cane and the cane is dry and brittle. There will also probably be found numerous little black points on the surface and a dusty or smoky stain, due to the presence of large numbers of the fungus-spores.

Some of the injury which has been put down to cane-blight is probably only partly due to this cause. In certain sections considerable injury has been done to plantations owing to the presence of hard-pan pockets in the soil, which hold water in the winter-time, resulting in death or weakening of the plants from "wet feet." In the latter case the plants will succumb to an attack of cane-blight which would not otherwise cause very serious damage.

Crown-gall.—This forms irregular knots, excrescences, or tumours on the roots or on the canes at or below the level of the ground. These interfere with the proper nutrition of the plants, which become stunted, the leaves turn yellow, and the crop worthless. When observed on thrifty plants, it is well to make an examination

of the root system. Plants found to be affected should be dug up completely and burned and no new planting made in that spot for at least a year.

Control of Raspberry-diseases.

Spraying has not been found very satisfactory as a control measure for raspberry-diseases, and other methods have to be relied upon.

Plant only healthy stock. If you can examine the plantation from which it is to come and assure yourself of its healthy condition, so much the better.

Destroy all wild raspberry and blackberry bushes in the immediate vicinity, as these are breeding-grounds for the fungi which attack the cultivated varieties.

Cut out the old canes as soon after fruiting as possible and *burn them*. Do not leave them lying about or stacked up near the plantation for any length of time.

Keep down weeds in and between the rows. They hold moisture and increase the liability to infection.

Blackberries and Loganberries.—These suffer from much the same diseases as the raspberry, but usually to a less extent. They are, however, liable to a form of crown-gall on the canes, the whole cane being sometimes covered with excrescences which either kill it or render it worthless. In such cases all affected canes should be cut out and destroyed. A good dressing of fertilizer should be given to promote new growth and careful cutting-out again practised. In this way it has been found possible to get rid of the disease. The Snider blackberry has been found particularly susceptible to it.

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This circular has been prepared by K. W. Munson, former District Field Inspector, and E. W. White, District Horticulturist, at the request of the Horticultural Branch.

Copies may be obtained free of charge on application to the Horticultural Branch, Department of Agriculture, Victoria, B.C., or from local branch offices of the Department.

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